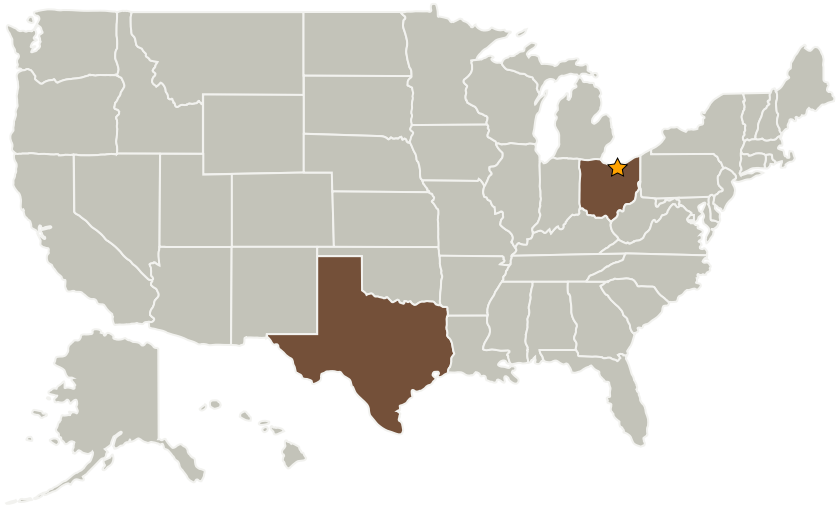
A Printable Silicon Nano-Field Effect Transistor with High Operating Frequency for Large-Area Deployable Active Phased-Array Antennas, Phase I

Completed Technology Project (2006 - 2006)

Project Introduction

Flexible electronic circuits can be easily integrated with large area (>10m aperture), inflatable antennas to provide distributed control and processing functions. Flexible electronic circuits can also perform dynamic antenna sub-arraying and gain pattern reconfiguration for active phased-array antenna (PAA) and thus significantly enhance the reliability of NASA's space radar systems. However, existing flexible electronics are based on organic semiconductor materials that have carrier mobility four orders of magnitude lower than conventional single crystal silicon. Such low carrier mobility limits the operating speed of flexible electronics to a few kilohertz and thus makes it unsuitable for multi-GHz RF antenna applications. The proposed research aims to develop a printable silicon nano-FET with high carrier mobility of over 400 cm2/V?s. Such a high carrier mobility provides an unprecedented opportunity to achieve flexible electronics with high operating frequency of over 40GHz. The high-speed flexible electronics are expected to be integrated large-area, inflatable radar antennas and achieve smart antenna systems for high performance and reliable space operations. In this SBIR phase I program, a preliminary printable silicon nano-FET will be developed and characterized for proof-of-concept verification. The feasibility of building high-speed flexible electronics and its monolithic integration with large-area inflatable antennas will also be demonstrated.

Primary U.S. Work Locations and Key Partners



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Organizations Performing Work	Role	Type	Location
★Glenn Research Center(GRC)	Lead Organization	NASA Center	Cleveland, Ohio
Omega Optics, Inc.	Supporting Organization	Industry	Austin, Texas

Primary U.S. Work Locations	
Ohio	Texas

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Glenn Research Center (GRC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Technology Areas

Primary:

- TX08 Sensors and Instruments
  - TX08.1 Remote Sensing Instruments/Sensors
    - TX08.1.4 Microwave, Millimeter-, and Submillimeter-Waves